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GLUCOSTRIA

THE LANCET PRACTICAL TREATMENT

DISORDERED NUTRITION

WITH THE

TREATMENT OF DIABETES

AND THE FOOD ADMINISTRATION

BY

WILLIAM SQUIRE, M.D., F.R.C.P.



LONDON:

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ON

GLYCOSURIA

AND THE RENAL SIGNS OF

PERVERTED NUTRITION

WITH THE

TREATMENT OF DIABETES

AND OF SOME CONDITIONS ALLIED TO GLYCOSURIA.

BY

WILLIAM SQUIRE, M.D., F.R.C.P.



LONDON:

J. & A. CHURCHILL,

11, NEW BURLINGTON STREET.

1887.

LONDON :

PRINTED BY GEORGE PULMAN, 24 & 25, THAYER STREET,
MANCHESTER SQUARE, W.

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ON THE RENAL SIGNS OF DISORDERED NUTRITION.

“A Mans owne Observation, what he findes Good of, and what he findes Hurt of, is the best *Physicke* to preserve Health. But it is a safer Conclusion to say: *This agreeth not well with me, therefore I will not continue it*; Than this; *I finde no offence of this, therefore I may use it*. For Strength of Nature in youth, passeth over many Excesses, which are owing a Man till his Age. Discerne of the coming on of Yeares, and thinke not, to doe the same Things still; For Age will not be Defied.”

Bacon.

In my essays on the health of children, many facts are set forth to further the progress of definite ideas in matters medical, and to lessen the uncertainties of medicine; it is hoped that some of the following conclusions, though drawn from a smaller number, but not an inconsiderable series of observations of another kind, may be acceptable, if not serviceable, to all who are concerned in the advance of medicine as a science. Two things appear from the comparative study of such cases as follow: one is that Glycosuria, and in all probability Diabetes, come under the denomination of preventable disease; the other that though this form of disturbed nutrition may occur at any age to either sex, the liability to it, greatest after middle age, is nearly equal for the two sexes. A word more on both these points; the formula “once glycosuric always glycosuric” fades to the faint image of a truth, existent in the background, before the numerous instances of complete recovery from attacks transient but persistent enough to have caused anxiety for months. Of the thirty cases mentioned at p. 15; the more alarming and serious ones show no recurrence of glycosuria under the various trials of health brought by further advance of years. On the other point; statistics published by our best authority on Diabetes, Dr. PAVEY, make it much more frequent among men than women; perhaps it need not be a matter of surprise that those who see most of women’s ailments should make the proportion the other way; it seemed strange, however, to me that among a series of men undergoing the same careful examination for another object by my old friend, SIR HENRY THOMPSON, that Glycosuria should, as he informs me, be very rarely found. The concurrence of uric acid with glycosuria has ever since the time of Prout been regarded as of good omen for the latter; it may be that we here have the converse of Prout’s law, and that glycosuric subjects escape the worst consequences of lithiasis. In the above instances, a previous medical examination has increased their value for the purposes in hand. Were patients to separate themselves into groups before going here and there for advice, the cases coming under the notice of the specialist would be more mixed; my experience of a large number of those said to have rheumatism, shews that home-made diagnosis is more often wrong than right.

The uncertainties of medicine recede with any forward step made on sound deductions from facts slowly accumulated and carefully compared; they re-appear with the easy repetition of old or new theories, or the lightly adopted guess, the latter sometimes recom-

mended on the false ground that it may be supported by subsequent experiments. These should precede and not follow assertion. Our knowledge of Diabetes has been of late thus obscured; the risk from surgical operations in this state is not increased since the use of Chloroform and Ether, as some suppose; others discover a special *pruritus* long ago mentioned by standard authors. As to a hypothetical acetonæmia; lately large quantities of acetone have been given (Baginski, Berlin Phys. Soc., 1887), for a considerable time without the effects on the nervous system that have been attributed to it; acetone is found in most febrile attacks, in some stages of growth, and in disturbances of digestion derived from the breaking up of albuminoids; it is not found in rickets nor during lactation.

The Uric acid diathesis should also come under the control of an advancing preventive medicine; a restricted diet alone does not suffice for this. A general failure of health may be traceable to over stress or impediment in one organ or function, and health returns as this is relieved. Even in age, local failure comes before general decay; a disturbed equilibrium in the work and waste of the body may often be observed in time to ward off an attack of illness, either by rest or diet; it is only permanent organic injury that necessitates habitual restrictions in food and work. The first failure in health may be of such kind as to lessen comfort rather than activity. The dyspeptic with contracted stomach has to do with less food than others, and may have to economize exertion. Still more care as to ingesta is required with weakened liver or kidney, sufferers from renal defect stand chill or exposure as badly as those who suffer from pulmonary complaints. An unjust discrimination is mostly made as to the relative share of gastric, hepatic, and renal disorder in defective health; stomach disturbance is put down to biliousness, when the diminished size of the liver, easily determined by percussion, shews that this organ is not receiving material enough for active function; the opposite to this occurs in glycosuria, and in this and some other disorders the kidneys are blamed when the liver is at fault. Sometimes renal excretion is below the normal from impaired hepatic action. Not only are the products of disassimilation transformed in the liver and prepared for excretion, together with some normal toxic principles from intestinal change, but poisons from without, including the medicinal alkaloids, are destroyed in the liver, and this the more quickly when its glycogenic function is most active; thus aiding greatly the active elimination of drugs by the kidneys. When the powers of either organ are weakened certain drugs must be given in smaller doses at longer intervals or they acquire a cumulative action. Some drugs modify the activity of both organs. Lead and Opium check their secreting power; Colchicum directly, Digitalis indirectly, with opposed cardiac influence, increase their activity. Where opium is relied on in the treatment of Diabetes the diet is also altered to a great extent, though no dietary restrictions are said to be enforced. The new coal-tar derivative, Saccharin, is not so available a substitute for sugar as is Glycerine.

ON GLYCOSURIA AND OTHER SIGNS OF PERVERTED NUTRITION AFFORDED BY THE KIDNEYS.



POPULAR comments on the uncertainties of medicine, sometimes supported by the sayings and doings of the medical profession, are often too readily admitted by most of us. We, as members of that profession, should, more frequently than we do, rather point out the certainties already acquired, and the common facts known to everyone on which rest much of our knowledge of disease and its treatment, as affording a solid foundation for the forecasts we are able to make, and the advice which we give to our patients. There are physical, chemical, and even vital facts, from which we form our conclusions, that can be appreciated by most people, and which should be more widely known. The dulness of the percussion-note over the disabled lung or the enlarged liver can be heard by others than ourselves, and the stridor of croup by those near; even the wheeze of asthma gives to all an idea of what may be revealed by auscultation. The distortion of a broken or dislocated limb is to be seen, and the crepitus of fracture felt by anyone, so are certain contractions and distensions of other parts, though skilled interpretation of the significance of these signs may be wanting. The evidence afforded by the thermometer is of more general comprehension, while the loss or gain of body-weight, one of the most important differentiations on which we can rely, is as simple a certainty to the patient and friends as to the doctor. Besides the physical means of research supplied by the measure and the balance, we sometimes place in our patient's hand test-paper as a chemical reagent or show him the effects of heat and acid on albumen; the vital phenomena of paralysis are mostly too obvious, and in obscurer cases the use of galvanic currents is intelligible.

What auscultation is as our guide to diseases of the chest, palpation to those of the abdomen, nerve-signs to the various affections of the brain and cord, such the examination of the urine is to diseases of the kidney—a means of knowing exactly the part that is out of order or diseased, the exact mode of alteration, and the stage

to which it has advanced. This is so well understood, and has been so thoroughly worked out, that little need now be said on this head. But the secretion distilled unceasingly from the kidneys is more than a witness to the state of the kidneys, and to the perfect order of all the parts of the apparatus concerned in the elimination of urine; it is evidence of the way in which the functions of the whole body are being performed, of the general rate and activity of change throughout, and of the particular excess or defect in special organs and functions. The greater part of the nitrogenous waste of the body has to be eliminated by the kidneys: they have thus a constant duty; the integrity of these organs is therefore of the greatest importance, as they have to carry off the results of increased tissue change from febrile or other disturbance, as well as any excess of nitrogenous matters taken in the food, many products of imperfect digestion, most of the deleterious matters accidentally or designedly imbibed, and some of the special products of diseased action. Thus attention to the characters of the urine is not only the guide to kidney disease, but gives valuable information of tissue change in the body, and of disease that would otherwise go on undetected.

These variations are for the most part easily noticed by the patient, such as the high colour and deposit in febrile states, and the increased quantity in diabetes, so that we may expect to have our attention directed to them. Those changes, on the other hand, which betoken disease of the kidneys themselves, are not so much under the patient's observation; and, generally, it is not from any complaint made to the doctor, but from his examination of the urine, that the first indication of the different forms of Bright's disease are ascertained. Here, again, a little more attention on the part of the patient would have led to an earlier recognition of renal disease; the appearance of blood in the urine or its coffee-like deposit in the acute congestion of the kidney, and the much diminished secretion of repeated attacks ought not to have been unnoticed. Any marked increase in the quantity of urine secreted, or in frequency of micturition, should also attract attention. Nor are these changes altogether unnoticed, but the illness that attends them passes; it is put down to cold or indigestion and not till the first examination, perhaps months after, reveals the true nature of the illness are the first symptoms remembered.

The early recognition of kidney congestion enables us to be confident of its cure. We have seldom to look upon some degree of albuminuria in the course of an ailment with the anxiety which its presence once used to agitate

our minds. We know that in most cases it will clear off; the more general and routine testing for albumin has shown how frequently it appears, and how completely it will disappear if rest and care be duly observed. Bright's disease is being continually prevented by our more systematic examination of the urine. Not only is this true for organic disease of the kidney, but it is largely so for the arrest of that most serious constitutional disturbance, diabetes, or for averting its worst consequences. In the particular series of cases now to be brought under review, the instances where albuminuria has been a mere passing occurrence are less numerous than those of temporary glycosuria. Those of chronic renal disease exceed the number of cases of persistent glycosuria, while those of acute kidney affection with recovery, and of threatened diabetes arrested, are about equal.

The object at present in view is neither the discovery of kidney disease, nor the exclusion of diabetes—a single examination mostly suffices to determine these points—but to insist on the value of frequent periodic recourse to the state of the kidney excretion as a guide to abnormal action in other organs, and to the nutritional changes of the whole body. For evidence against the much-abused liver, an organ more sinned against than sinning, it is safer to trust to the signs of biliary colouring matter in the urine than to any supposed bilious look in the face or a yellowness of the complexion; the latter may result from a temporary congestion, perhaps from the relaxed vessels of exhaustion, or the bloodshot eye of watching or grief, with anæmia rather than lithæmia, and not from impeded action of the liver or from bile in the blood. The true icteric tinge is readily distinguishable from the above conditions, but not always from the tinge given to the skin by other cachexiæ; when discolouration is owing to bile in the blood, its presence in the urine can easily be verified by the green change produced by a drop of iodine solution, and, this evidence is required to show that bile is still present in the blood, as the staining of the skin may remain after its cause has ceased to exist. Frequent examination of the urine might afford a clue to the early diagnosis of obstructed gall-duct, from those more profound causes of jaundice which come under the head of arrested metamorphosis or perverted nutrition.

The presence of biliary acids in the urine is not so conclusive of anything wrong with the liver as is often assumed; without a concurrence of tenderness and fullness of the hepatic region, or of undue resistance and altered outline, it is rash and often injurious to infer an hepatic origin for our patient's ailments; even with these local

signs, debility, anæmia, heart disease, or malaria may concur in their causation. The furred tongue and loaded urine of dyspepsia and gastric or duodenal catarrh are beginning to be rightly appreciated; in these cases there is nothing wrong with the liver. A little hot water added to the turbid urine clears off at once the fear of this being due to anything wrong with the kidneys, and shows that they are merely sharing the extra work brought about by temporary disturbance of equilibrium. The more numerous so-called class of "bilious attacks" accompanied with headache or megrim, where the tongue is clean and the urine clear and abundant, are entirely neurotic.

Several of the more common variations of the urine require mention: under normal conditions, if the quantity is increased the specific gravity falls, but a persistently low specific gravity points to impaired kidney function, and may be associated also with such signs of faulty assimilation as the presence of uric acid, oxalates, and even sugar; on the other hand, a specific gravity of 1025-30 is no proof that a sufficient elimination of urea is going on, for the quantity of the fluid may be reduced to fifteen or twenty ounces in the twenty-four hours, and the total elimination of urea to one half of what it should be. In all cases it is important to know what is the daily quantity, and whether under present conditions that quantity is increased or diminished. In most cases the exact measurement of quantity for one twenty-four hours should be obtained. Where one is consulted only at intervals, it may suffice to direct that the water brought for examination should have been passed at certain specified times. In other cases it may be directed that the whole quantity for the day or night should be reserved for inspection. No case that requires repeated medical attention should be without at least one record of the state of the urine; when there is nothing wrong, such a record is often most valuable evidence in subsequent illness; it is a ground of confidence at the time, and afterwards may be a guide to treatment, or aid in securing a favourable life assurance that might otherwise be refused.

Besides having in all cases always made the usual notes as to the urine, the routine of the last forty years in our hospitals, for the last few years it has been my rule to use Fehling's cupric test as regularly as nitric acid. The solutions of copper and of the alkali should be kept separate and mixed at the time of using, otherwise discoloration is apt to occur with reducing agents of less activity than grape sugar. A remarkable red or orange opalescence is produced with this test in a certain number of cases where no oxide of copper is actually reduced and deposited. In some of

them, as in those where glycosuria has existed, a little fine oxide will in time subside, but in others nothing of this kind occurs, and the causation still remains doubtful; it has been found with excess of either uric acid or of oxalate of lime, though it is not always thus associated, and some peptones in the urine act in the same way; the general condition accompanying it is mostly one of impaired health, with either dyspepsia, fatigue, and low spirits, or with more serious disturbance, and perhaps chronic organic disease. It may be found for a short time only, or persist for years. Supposing the turbid orange deposit indicative of the presence of sugar to occur, for determining its quantity we bear in mind that each drachm of Fehling's solution is equal to a quarter of a grain of sugar or glucose, so that beginning with two drachms of urine in the test-tube, and heating it successively with one drachm and then with a second drachm of the test, we readily see if the quantity of sugar present equals or exceeds one or two grains to the ounce; when in greater excess, first dilute the urine with three times its bulk of water and proceed as before; then, if necessary, deal with one fourth of this in the same way; it is obvious that each drachm of test used in the first dilution is the equivalent of one grain of glucose instead of a quarter of a grain, and in the second dilution it is equal to four grains to the drachm of the fluid under examination. The result thus obtained has been checked by the volumetric and fermentation processes, and found to be accurate.

Among the last two hundred cases in my note-book, I find that glycosuria has existed in no less than thirty-one. Of these, five had been under observation previously, two being cases of diabetes, two of persistent glycosuria, and one, a young man still under forty, who has long been free from all signs of diabetes that once threatened.

To the two cases of persistent glycosuria, both over fifty, a man and a woman, I have to add three others, a man of about fifty and two older women; in those, diet and care control the amount of sugar, and sometimes remove all traces of it; they know for themselves when and to what degree dietary restrictions are needed.

There are six cases of persistent or recurrent glycosuria, the amount mostly small, and rarely requiring special dietary precautions; four of these are in persons over seventy years of age, one is a spare active man with failing memory, and three are rather stout women, one arthritic, one active but at times depressed, the other with slight albuminuria and other signs of degenerative changes; two of these cases are women of middle age, one active but neurotic, the other intemperate and with chronic changes in liver and kidneys.

Twenty cases remain where glycosuria has completely disappeared; five of them suffered to a serious extent while under observation; in these five, two years have elapsed in two cases, and more than a year in two without recurrence, so that the tendency to diabetes in those cases is for this length of time at least escaped. Two of the cases were men and two women, all a little over forty years of age; in each case there was a considerable amount of uric acid either with or after the glycosuria; in one case, where the amount of glucose averaged ten grains per ounce for nearly six weeks, and the quantity of urine varied from five to eight pints in the twenty-four hours, there were arthritic and thoracic complications. One of the men first came under my notice for serious hæmoptysis soon after his return from India, and was considerably emaciated; both the women were stout, and unable to take much exercise. The remaining case, a man *æt.* fifty, belongs to the larger category where no question of diabetes had before arisen, though subsequent experience in this and in some cases of both classes may not be entirely without danger of that contingency.

There remain then fifteen cases of transient glycosuria—six men and nine women; four of the men were over fifty years of age, and two were under forty years; five of the women were over fifty, and three under forty years, one, a girl of twelve years old, after scarlet fever. This girl, who was generally healthy and well-grown, had in January 1884 a trace of glycosuria; in ten days this had completely disappeared, after a little rest from Christmas festivities, with slight modification in diet, and was absent at the end of April. She had had scarlet fever in the previous summer, with glycosuria from the fifth to the tenth day of illness; the highest temperature was 104° on the fourth day; on the fifth day the tongue was moist and the skin very red; urine 1020, clear, high colour, no deposit, no albumen, but a trace of sugar; on the sixth and seventh days the temperature fell to 101° and 100° , the tongue was red and tender, there were some doubtful articular aches and pains, the urine was freer, with both phosphates and uric acid in excess, the sugar equalled one grain to the ounce; during the next two days the sugar increased somewhat, but did not exceed two grains to the ounce; it had disappeared altogether by the twelfth day, and was not found at the end of three weeks; desquamation began on the eleventh day and was not over till the thirty-fourth, when convalescence, which had been uninterrupted, was complete. Glycosuria has been noted as occurring late after severe scarlet fever; I have not met with it before in the early course of the disease, nor have I found it yet in whooping-cough.

Two other of the above cases in women are remarkable as following severe attacks of summer diarrhœa; the first, a nurse, aged twenty-seven, suffered extremely from contaminated drinking water, in July, 1883, severe diarrhœa and vomiting lasting five days; she had some secondary fever, with pain and thirst another five days. A month after this she continued weak and thirsty, the urine in excess, pale, sp. gr. 1016, with two grains of sugar to the ounce. A month later, with special care as to diet, recovery was complete. The second case met with after diarrhœa in the summer of 1884, had no glycosuria after a similar attack in the last hot season. Two exceptional cases were found associated with delirium-tremens; in one, a man under forty years of age, glycosuria was not discovered till the attack was passing off; in the other, whose attack was not the first nor the worst that had been experienced, this occurred on the second and third days after being without alcohol; there were tremors and want of sleep, the bowels had acted, and the tongue was clean; soup and eggs were taken freely, urine 1022, high in colour and darker with nitric acid, no albumen, but well-marked trace of sugar; next day, after sleep from bromide and Indian hemp and no restriction in diet, milk being allowed, the urine was paler, free, giving only a red opalescence with the cupric test, and depositing numerous oxalates. During convalescence, Fehling's test was no longer discoloured though oxalates continued to be abundant; there was no microscopic evidence in the urine of renal mischief, and with a daily secretion of fifty ounces, sp. gr. 1016-17, a prospect of longevity is open to this elderly paroxysmal tippler which is closed to the younger victim. I have one case where slight glycosuria and a little albumen appeared during the treatment of some tertiary nerve symptoms; both entirely disappeared.

The more ordinary cases, then, in which transient glycosuria has to be accounted for or its associations stated, are nine only—four men and five women. All are over forty years of age, one of the men and two women are a little over sixty years; one of each sex is stout; all have been active and, excepting the youngest woman who is neurotic, are energetic, temperate, and accustomed to live regularly and well. Two of the ladies are liable to excess of uric acid. The two others, both over sixty years of age, have been rather tried with family cares; one was affected in the manner under consideration for a short time after a domestic trouble; the other after the fatigue of a continental tour; in this case the glycosuria was soon overcome, but there is recurrent albuminuria and marked general debility. Of the four men, the oldest, who is stout,

had noticed uric acid at times, and once the urine had afforded a red opalescence with the cupric test before it gave decided evidence of sugar; this was soon removed and no special diet required; he had some pulmonary congestion last winter, the heart is weak, he is of sedentary habits, and has been too dependent upon blue pill. The next man, at fifty-eight, much occupied, caught cold on a business journey last winter; it left him weak and restless with cough, but no pulmonary râles, he had lax throat, clean tongue, increased extent of hepatic dulness, bowels kept free by frequent pills or seidlitz powders, urine 1030, lithates, and sugar four grains to the ounce. After a week's rest and careful diet the sugar quite disappeared and the hepatic fulness subsided, the urine became abundant and pale, sp. gr. 1018, numerous oxalates. The third case is that of a tall well-built man training himself in this way: he walked before breakfast, then took porridge or cocoa, and tricycle exercise afterwards to free perspiration and fatigue; soon he could neither eat nor sleep well, he felt thirst, the tongue was red and rough; urine free, 1027-30, nothing wrong except one grain of sugar to the ounce. During a fortnight's rest and fit diet he regained his sleep and appetite, thirst less, urine free, 1026, deposits pale lithates, only a trace of sugar. Next month he had got back to his full weight, 13st. 10lbs., and he was quite well; urine clear, sp. gr. 1023, no sugar, but orange opalescence with cupric test. This discolouration was noted at the same time in a very active man, æt. fifty-six, a great pedestrian, who had lately overdone his walking powers and had an obscure form of sciatic neuralgia; also in an elderly man with sciatic pain or lumbago. My last case is that of a healthy-looking man æt. forty-three, who had symmetric pain in the middle of the thighs, with depression of spirits, there was increased hepatic fulness but a clean tongue; the urine was loaded with lithates, and not only gave the red opalescence with Fehling's test, but a well-marked indication of sugar; this was removed with a few days' care and the hepatic fulness disappeared. He has at other times had gastric symptoms purely neurotic, and once lately the hypochondrial fulness has returned but not the glycosuria. In only three of the last fifteen cases is there evidence of co-existent hepatic disturbance, and in two of these it would seem that the increased area of liver dulness might be owing to fatty change, which would continue whether glycosuria were present or not. In two of the more persistent cases the evidence of cirrhosis with other degenerative changes renders the presence of a previous hepatic hypertrophy probable.

In several of the cases under review, and in many really

diabetic, attention has first been directed by some curious and perhaps bilateral neuralgias to the possible existence of glycosuria ; in others anæsthesia, as of the soles of the feet or loss of tactile sensibility, has been noticed, with loss of knee-jerk in some of them. In only one of my cases have ataxic symptoms appeared, and those six years after the occurrence of glycosuria ; yet old sufferers from ataxic pains have rarely afforded an instance of this coincidence, which, however, has been known to occur. On the other hand, it is impossible to look back over a large series of diabetic patients without noticing how often nervous shock, mental trouble, or anxiety and fatigue, or over-exertion, have been concerned in determining this condition, and, excepting some cases of constitutional failure or of inherited tendency to this state, without conjecturing how many might have escaped the worst consequences of diabetes could rest and care have been adopted on the first appearance of glycosuria !

The number of cases of glycosuria here under review, though of themselves insufficient to warrant any very general conclusions, are not without value ; they show the degree of frequency with which this class of case occurs in proportion to the incidence of other ailments, and they admit of comparison with the deductions commonly received as to diabetes. They correspond very closely to the latter disorder as to the age at which both are most frequently met with, and agree with many of the chief features of the more serious disease. But they are at variance with other characters ascribed to diabetes, and especially with the often recurring statement that "men are more liable than women to this affection ;" they, however, agree with, if they do not surpass, Bouchardat's estimate that glycosuria occurs once in every twenty invalids among middle aged persons of the well-to-do classes. Quite recently Dr. Lecorché has asserted the very great frequency of diabetes in women ; this is in accordance with my results ; together they shew that no peculiarity of race is concerned in such liability

In this series of two hundred cases of all kinds of ailments, exclusive of dispensary patients and children, who have come under my special examination, it is rather by accident than by design that the numbers of each sex should have been nearly equal. It also happens that about half of each sex are under forty years of age ; and, that the numbers of those who have consulted me at my house and of those who have been visited by me at their own houses are nearly equal ; a further division as to the ages of these two classes shews that rather more of those coming to my consulting room are among the younger

men. It is this last class that has afforded half my male cases of glycosuria. Where the cases are drawn exclusively from those who came to the doctor for advice, especially in this form of ailment, the number of men would naturally exceed the number of the women who apply in the same way and thus the proportion of men to women seen in the consulting room is greater than in reality it should be ; in some statistics it has exceeded two to one. Now in the cases under notice this proportion is reversed, there being twenty-one cases among women to ten among men, and at the ages most apt to glycosuria and diabetes, forty to sixty years, the proportion of women to men is actually three to one. In looking back over the comparatively small number of confirmed or fatal cases of diabetes that have come under my own observation the incidence in men has been greatest, but not to any great extent ; and in instances of family predisposition sisters have in my experience suffered in a very marked manner. Even if diabetes be more fatal with men, and the Registrar-General's returns sanction this view, my experience points to glycosuria being more frequent among women, and specially at the particular ages when diabetes is most common in both sexes. The question then arises why glycosuria should more frequently pass into the more serious condition in men than in women. One probable reason for this is that women can more easily, and perhaps more frequently do, obtain rest when the first feeling of illness begins ; they certainly are more careful in carrying out the doctor's instructions when the disease is established. In one case, fatal to a young woman, the existence of diabetes was not suspected till thirst, emaciation, and other advanced signs had gone too far to be arrested, yet the condition had probably existed since an attack of scarlet fever ten years before. It is not unusual after middle age to find nearly an ounce of sugar excreted, unchanged, daily by the kidneys for years, with very little impairment of vigour, till finally pulmonary congestion, phthisis, or a carbuncle happens, and the diabetic state receives no mention. This is more likely to occur when the dietary has been for a time neglected. It is known that in the course of diabetic pneumonia, as in other intercurrent febrile states, the excretion of sugar is often interrupted, so that the existence of glycosuria during such illness may be unknown ; hence many fatal cases escape notice under the heading " Diabetes " in the Registrar-General's reports.

It might be objected that the majority of my cases are in nowise related to those of a more persistent glycosuria liable to pass into diabetes ; that a trace of

sugar is not uncommon, and that a temporary glycosuria is well known to occur in the course of some diseases, or during convalescence. Three of the above cases may be so objected to; but, they occur in the three youngest persons out of the whole thirty. In the other cases more than a mere trace of sugar was found; in some of them as much as six, eight, and ten grains of sugar to the ounce. Moreover, these cases fall at precisely the ages when the tendency to diabetes is greatest. Of the men three are over sixty years, three are over fifty years, three are nearer forty years, but all are over that age. Of the women ten are over sixty years, four over fifty years, and three over forty years of age. Another objection may be made that those are all cases of gouty glycosuria, a state which, by definition only, is made to be unimportant, transitory, and of slight amount. Two only of my cases have clearly a gouty history; one is of spare habit, the other is stout; both are chronic invalids; in both the glycosuria is permanent, and in the shorter and older subject soon reaches to a considerable amount whenever dietary precautions are neglected. Again, if most of these cases are gouty how is it that two thirds are women, while gout is much more frequently met with in men. Glycosuria is in fact only one of the signs of disturbed nutritive processes. Impaired nutrition may happen to all, at any age; it must occur with advancing years, and glycosuria is one evidence of it at least as likely to occur in women as in men.

Professional misuse of the term "gout" has become, or is becoming, so general that some protest against this laxity of thought and of expression is a necessary preface to the further consideration of the subject in hand. Any obscure pain in young or old is loosely called gouty; every neurotic accident in the young or middle aged is attributed to "gouty acid," or a "gouty tendency;" and every sign of the various organic failures that mark the ingress of age is gout! Our patients more readily submit to this impeachment than assent either to the bald assertion that senile degeneration has commenced, or to the mere truism that they are not so young as they have been. Analysis ought to be carried a step beyond what is implied in these terms, both for our own satisfaction and peace of mind, and for the benefit of our patients' health. To speak of gout in every pain we are called upon to cure is to be like the bonesetters, who find in every stiff joint "dislocations" which they profess to reduce: for both ignorance is the only extenuating plea.

After middle life when repair is less active, and waste matters less readily eliminated, a new balance

between ingesta and expenditure of energy has to be assumed. Very often the amount of work should be diminished rather than the amount of food. When the quantity of food taken at one time is lessened the times for taking it have to be increased. If increased elimination be desirable, and diminished supply also advisable, it becomes doubly necessary to refrain from even ordinary exertion and fatigue; or, some one organ may be impeded in its action, and that has to be relieved before all will work smoothly. Where none of those impediments exist a little good wine or well-advised stimulants will help over the difficulty; it is a very quiescent gout that is relieved by old port, however matured. In other cases a more slow but sure way out of pain or discomfort is found from enforced rest and steadily increased feeding; the converse of this is required in hysterical cases where increased exertion or work of some kind is a necessary preliminary to a full diet.

These diverse disturbances of assimilation and nutrition, and the various combinations of them met with, are spoken of as gout, mostly or often with the reservation of "suppressed" or "latent" as a prefix. When increased waste and checked elimination befall one in vigorous middle age, neglect of the usual warnings leads to febrile and arthritic complications, even in those who have no inherited liability to gout. Something like this is seen in children when a sudden attack of scarlet fever is followed by rheumatic symptoms. Moreover, in all febrile processes the nitrogenous waste and even the nitrogenous food is broken up into glucose, to be used in the increased heat production, and into urea with uric acid. The increased quantity of uric acid resulting from the large supply of beef tea, soups, and jellies, to invalids and convalescents is perfectly well known and understood.

In later life the tendency to form or deposit uric acid becomes more marked in some people, and then with closer relations to the arthritic than to the gouty diathesis. Glycosuria is not unfrequent in those subject to uric acid in excess, and sometimes alternates with marked sabellous deposit. It almost implies uric acid, for albuminoids break up into sugar and urea, and extra nitrogenous food will account for some of this excess. This is certainly not the gouty glycosuria usually mentioned, for in no cases is the benefit of a rigid dietary more quickly manifest. Quite recently on a vigorous man of middle age, four days of careful abstinence from sugar, bread, and starchy food, removed all trace of glucose from the urine; this had been six to eight grains of sugar to the ounce with fear of acetone, as perchloride of iron instead of causing any

deposit gave at once a clear red-brown colour to the urine ; the specific gravity had at the same time fallen from 1030 to 1020 with an increase of urea and considerable deposit of uric acid ; the usual deposit with perchloride of iron was readily soluble in excess but without alteration of colour ; this iron test, though not alone a proof of acetone, is often a guide to faulty assimilation, when instead of turbidity it gives rise to a clear red-brown colour. An intermittent glycosuria was described by Dr. Bence Jones in 1853, where sugar alternated with lithates. Claude Bernard also refers to an alternating diabetes where uric acid appeared in the intervals. In several of my cases, with after deposit of uric acid, the sugar did not reappear upon return to a mixed diet ; in two of these more time must pass before we can know if they relapse.

Decrepitude advances in another mode, wrongly ascribed to gout, with altered arteries, granular or contracted kidneys, and changes in the heart or liver. It is not always easy to say on what these depend, this was a difficulty debateable in Shakespeare's time,¹ and though not yet cleared up some advances have been made in the elements of discrimination. The effects of heart disease on other organs is better understood, how failure to send on the blood enlarges the liver, how too much cardiac force with inelastic arteries are related to contracted kidney. Alcohol has its part assigned to it : and, when deposits of urate of soda are found in the kidney, in the coats of the arteries, and in the fibrous tissues or cartilages, it is known that gout is concerned in the associated diseases. Without such limitations we should be forced to conclude gout to be a disease affecting the lowest classes rather than the highest, and to be as common in the hospitals of London, Paris, and Edinburgh, as among our upper classes and the aristocracy.

Glycosuria may occur with any of the above conditions ; it is rather when in combination with degenerations, not gouty, of various organs that it is met with to a slight extent only, and with little liability to sudden increase. In this association extreme rigidity of diet is neither requisite nor beneficial ; very often the quantity of urine is but little increased and its specific gravity very low, even down to 1.006 ; or, with a normal specific gravity the quantity is much reduced, albuminuria with tubular casts occur ; perhaps also sickness, with the red tongue and dry centre of chronic renal disease. In some such conditions as these the arrowroot and skimmed milk diet now and then recommended may be appropriate. There are other

¹ Henry IV., part ii, act i, end of Scene 2.

cases where albuminuria has been occasioned by the prolonged excretion of sugar, and in those a restricted diet should precede the cautious use of milk, or the adventure of paradoxical methods of treatment. Why butter-milk or skimmed milk should be advocated in glycosuria has never yet been satisfactorily explained. All the sugar of milk remains in those two varieties, and only the cream and butter, specially suited to the diabetic, are abstracted. Frequent experience has shewn that until milk in large quantities had been replaced by the sparing use of cream, glycosuria could not be overcome. On the other hand glycerine, which theoretically might be expected to form glucose, may be used in some quantity. An ounce daily has been given without any increase in the amount of sugar appearing in the urine.

Great caution is always to be observed in the first dietetic directions on glycosuria being detected. Unless there is already diuresis, or the quantity of sugar exceeds one grain to the ounce, no special diet is advisable. Sugar may be objected to as likely to cause acidity; and a passing caution may be given against oatmeal, rice, corn flour, and starchy foods. The quantity of bread and of potatoe may be limited on the score of digestion, but it is better not to cut off potatoes at once, they afford much less starch than an equal bulk of bread. In toast the bulk of the bread is lessened and so the proportion of starch is increased; thin new bread and butter is preferable. Gluten rusks to eat with or after dinner, if procurable under some other name, can be enjoined with more safety and less alarm to the patient than is risked when potatoes are prohibited. To avoid this common vegetable attracts the notice of friends, who speak mysteriously of diabetes and frighten the patient into endless forms of rashly imposed penance; either a routine treatment is begun with undue strictness, or further medical advice is sought, when perhaps, the glycosuria has disappeared, and a doubt arises if there ever were occasion for any treatment at all. In the most severe cases there is more danger from disgust of all food than from moderate indulgence.

Persistent glycosuria established before middle life is reached has a much more serious outlook than when commencing after the fortieth year; even then, when fully established, constant care as to diet and mode of life is requisite; it is said to be less serious in stout persons, a proposition which amounts to this, that a progressive loss of flesh shews nutrition to be already impeded. Prognosis depends more upon the habitual amount of sugar excreted than upon the body weight, unless something be allowed for the relation of the one to the other.

No case is without cause of anxiety, if, after a strict dietary, the urine contains four or five grains of sugar to the ounce, that is, about one per cent. To be of medium severity the proportion should be considerably below this; the case is severe if the sugar reaches three per cent., and with fifteen or more grains to the ounce would soon prove fatal. A man of twelve or thirteen stone weight, living carefully, may pass half an ounce of sugar a day safely, while another of nine stone would be in some danger if excreting half that amount constantly. In thin people with profound disturbance of nutrition, this amount would result in cutaneous or pulmonary obstruction, with other complications likely to prove fatal. A young person has been known to excrete fourteen ounces of sugar daily by the kidneys and yet improve under a moderately restricted diet; but, with no very hopeful prognosis.

It is estimated that from four to six or seven ounces of glucose are passed into the blood every day, to be utilised in the work and nutrition of the body. Sugar is the immediate material both for heat and work; the more active the vital changes going on, the greater the transformation of glycogen. The limit to this, fixed by the amount of oxygen supplied in respiration, is about twenty-four ounces. Glycogen is formed in the muscles as well as in the liver, and, after food, is stored for use during active exercise and accelerated respiration. In prolonged fasting more sugar is formed in one day than all the glycogen of the body would yield. Here albuminoids are reduced to sugar and urea; fats are utilised, and so, perhaps, glycerine, but none of these substances supply sugar in ordinary nutrition. In such loss of flesh a little farinaceous food, given with fat, cod liver oil, or butter, checks the nitrogenous waste. The formation of sugar is a necessary vital process; it is always going on, and that to a greater degree than is usually supposed. This formation may for a time be in excess, and during some impaired control over the first nutritive changes, the increased formation of sugar may continue; but in most cases of glycosuria there is no increased formation of glucose, but an interference with the subsequent molecular changes in respiration and nutrition which arrests the constant transformation of sugar, and hence its accumulation in the blood. It may be that a slight excess tends to excite the hepatic function, so acting like a ferment in determining a further increase; or a certain excess may act on the nerve centre, and so weaken the controlling power. There can be no glycosuria without a preceding hyperglycæmia; and this, excepting some cases of diabetes, and in some cases of transient glycosuria, must at first have been from error or arrest of

nutrition, and not from over-production. The kidneys are concerned in no other way than in removing the excess. Prolonged overwork of this kind leads to hyaline changes of structure, not limited to the secretory organs; other waste products accumulating act in the same way. The continued excess of sugar in the blood, and of biliary salts acts on the myocardium, and so weaken the heart.

Arrest or disturbance of the normal molecular changes in any part of the body may start glycosuria, just as azoturia depends on imperfect nitrogenous metabolism, the kind of change being determined by some special predisposition, often hereditary. The place held by oxaluria may be either distinct from or intermediate to the above, and it marks a grade between glycosin and urea; it is also a step towards uric acid. Chemically, oxalic acid differs from glycogen, not only by an increase of oxygen, but by dehydration, a change precisely the reverse of that from glycogen to sugar. Clinically, it appears as crystals of oxalate of lime in the urine, under conditions very similar to those in which uric acid is deposited. It is not unfrequently associated with a temporary albuminuria. The albuminuria has in some cases seemed to be excited by the presence of these crystals; in one case hæmaturia appeared at the same time. Besides the instances given of the co-existence of oxaluria and glycosuria, there is one of the series in which it preceded, and one in which it followed upon that condition.

Oxaluria is noted in twenty of the two hundred cases here reviewed. Of these, seven men were seen at my house; three of them were under forty, and three women, all under forty years of age. Seen at their own homes were five men and five women, all more than forty years old. Three of the men seen here, one young and two old, had nervous ailments to the verge of sanity. Of the four others, the two oldest were in failing health, and one has since died; the two younger both had albuminuria, from which one has recovered. Of the men seen at their homes, two were weakened by illness, and one had cerebral congestion, with limited incomplete paralysis, one was a senile hypochondriac, and one intemperate. Among the women, in only one case was the condition at all persistent. This was in a spare, temperate, gouty subject, with albuminuria, both ailments passing off completely. In the other cases, neuralgia, dyspepsia from irregular meals, and fatigue or worry were associated. In these cases, altered habits and attention to diet, with the mineral acids at meals, soon restored health. Oxalic and oxaluric acids are always found in the urine. Those cases where the oxalate of lime appears constantly, and not from a tem-

porary indigestion, are often of more serious import. Oxalic acid may be concerned in what is called "acidity," or may be formed and transformed in some nutritional changes; but here the lime with which it is combined must come from the framework of the body, and is an evidence of a profound denutrition. This is so when, as in ricketts, earthy phosphates appear in addition to the common tribasic phosphates. Several instances of oxaluria in children, with ricketts, scarlet fever, and some wasting diseases, have come under notice in a different series of cases.

Oxalates may occur with phosphates, with uric acid, and with the urates. In the latter case, on the addition of hot water to dissolve the urates, the "hummocky" surface of the deposit of fine mucous will be revealed, which is often a guide to the presence of oxalates. Many instructive instances are on record of the occurrences of oxalates in the urine after disturbances of digestion. With some persons, taking champagne at dinner is followed by such deposit. Dr. Lauder Brunton has observed that cabbage for dinner with hospital patients has had a like effect. Some persons must have found rhubarb to disagree in a similar way, or the crude theory that oxalates taken in the food would reappear in the urine would never have been started. Oxalate of lime is the most insoluble of all the urinary deposits; it is neither made soluble by alkalies, as is uric acid, nor by acetic acid, as are the phosphates. It is inconceivable that the large crystals seen in some vegetables, sorrel for instance, could either be absorbed into the blood, or could pass through the capillaries, if their presence in the blood were possible. Any oxalate of lime taken in the food would be passed as insoluble refuse in the fæces. Moreover, sorrel taken freely by convalescents from oxaluria, under my observation, has not caused a return of the oxalates.

Phosphatic deposit, appearing as a cloud in heating the urine, is unimportant; it disappears on adding a little acid. The prismatic crystals of tribasic phosphates form whenever the urine ceases to be acid. A slight taint of acidity may cause the urine to be turbid from phosphates as it passed; it soon becomes clear again with some tonic and a little more out-door exercise. Care may have to be taken against the formation of a local deposit of ammonio-magnesian phosphate where there is vesical catarrh, enlarged prostate, or the presence of the ammoniacal ferment.

Azoturia is easily recognised, and is easily controlled. An ounce of urea should be excreted daily in health; but the exact quantity varies much, and chiefly as to

the kind of food taken. It forms more than one half of the solid constituents of the urine, and should be in the proportion of nearly two per cent. to the whole quantity passed. If, in the adult, in the absence of fever, the proportion of urea exceeds this, a less nitrogenous diet and more diluent should be taken. Before judging of such excess, the quantity of urine passed in the twenty-four hours must be ascertained, as well as its specific gravity. It is obvious that forty ounces at 1025 is equal to fifty ounces at 1020, and that thirty ounces at 1030 equals sixty ounces at 1015 in the contained solids. In urine of higher specific gravity, excess of urea is shewn by adding an equal bulk of nitric acid in a test tube, when, after standing in a cool place, crystals of nitrate of urea are formed. Excess of uric acid will appear in crystals on adding one twentieth part of hydrochloric acid. This may be found to exist in urine of low specific gravity, with no excess of urea.

The reactions of the colouring matters in the urine to certain tests require a short notice. Indican, when present, is found by adding a few drops of the *liquor calcii chloridi* to equal parts of urine and of strong hydrochloric acid. The blue colour produced is indigo; this can be separated by shaking with chloroform, which in subsiding carries down the blue, and leaves a purple-red fluid above. Sulphuric acid will give a bright rose-pink colour, supposed to be acetone, in some cases of extreme illness. This colour, if due to acetone, is removable, or may be prevented by heat, and is changed to a fine orange by perchloride of iron. The tincture of perchloride of iron alone, in these cases, gives a red-brown colour, with little precipitate. This reaction takes place after boiling, if the test tube is again cooled, while acetone would have been expelled by the heating. In a totally different class of ailments, the preeipitate, formed by a few drops of this solution of iron, and re-dissolved by the addition of a few more drops, assumes a red-brown in place of the yellow colour of the iron. When the urine is loaded with lithates, it may be diluted one half, and slightly warmed before testing in this way. The deposit with iron is sometimes due to peptones, when a further coagulation occurs on heating after the addition of the iron. This is re-dissolved on adding strong acid. The red-brown colour is not changed by heat or acid. It is discharged by chlorine.

Tincture of the perchloride of iron shows the rapid appearance in the urine of the salicylates, when given as medicine, by the deep purple colour produced. This colour is destroyed by mineral acids, but chloride of lime only makes it a lighter red. The general dark hue pro-

duced in the urine by the absorption and oxidation of carbolic acid is well known. The yellow discolouration from santonine, or the red colour of chrisophanic acid, as after taking rhubarb, are both distinguishable from febrile discolouration or the bile pigments by being rendered deeper by caustic alkali, and removed by acids. Nitric acid, mixed with healthy urine slightly deepens the colour; a few drops trickled down the side of a test tube should neither give an opaque layer from albumen, nor the pink ring at the point of contact with the urine. This last may indicate disturbance of hepatic function, better remedied by rest and a generous diet than by aperients and restricted food, especially when unaccompanied by any tenderness or increased area of dulness over the hepatic region. The too active liver of diabetics is liable to a recurrent form of inflammation, in which epithelium detached from the smaller ducts furnishes the nuclei for cholesterin deposits. Hence, multiple gall-stones. In these attacks saline aperients or mineral waters are useful.

The kidneys, while often guiding to disturbance of other parts of the body, always give unequivocal and certain evidence of their own disorder. All pain, sense of weakness, or other sensations giving rise to a suspicion of renal disease are to be put aside and the state of the water alone appealed to; testing this will clear up and very often remove all doubts as to anything wrong with the kidneys, and this alone not unfrequently reveals mischief when none was suspected. With early nephritis in the glomeruli and smaller tubules the urine is much reduced in quantity, with high specific gravity, and is often dark, perhaps with admixture of blood; in hepatitis also it is high coloured and scanty, and continues loaded with pink or dark lithates in commencing cirrhosis; but in the latter case, unless kidney and liver are affected together, there will be no albuminuria. In chronic renal mischief pale urine of low specific gravity is common, seldom without albumin, and never without microscopic evidence of disease; this, and a careful estimate of the reduced quantity of urea eliminated, will always guide to the degree of renal inadequacy existing. Specific gravity alone is no guide; once with this at 1027 the quantity was only 15oz., and only eighty grains of urea eliminated per diem. Under treatment the relation of specific gravity to quantity altered, but the urea never came up to four drachms, or half the normal, and the patient's health continued invalid and precarious.

Two-fifths of all the nitrogenous waste of the body has to be secreted as urea, so that loss of this special renal function is irremediable, and more danger is to be apprehended from continuous deficiency of this

element than from the accidental presence of albumin or of sugar. The opposite conditions of excess and defect of urea are allied by closer bonds than are seen at first sight. In children, with less nitrogenised waste and a less azotised dietary, the quantity of urea formed is proportionately less than in adults who work hard and live well. In age the rest and diet of childhood are gradually approached. But no one knows when and how this change comes about, nor the time, if it ever come, when the precept of Ofellus, or Cornaro's dietary for aged persons, as recommended by Sir Henry Thompson, is to be adopted; perhaps, even the opposite system may be necessitated by the failure in assimilation beginning with farinaceous rather than with animal food. The limitations imposed by age are sooner recognised than the first warnings of a breakdown in middle life. At middle age work has become more a necessity or more remunerative; hurried meals are to supply the material for prolonged exertion, digestion is disturbed, some one organ suffers, or an undue strain is thrown upon others, and the healthy co-operation of all is upset. It could be shown how excess of urea by over-taxing the excreting organs initiates changes by which less and less of the work of these organs can be done, and how this crippled state could have been arrested by a timely investigation into the balance of health.

When any feeling of illness leads to a medical consultation the alterations found in the urine not only indicate the presence of disease which might otherwise have remained undetected, but afford valuable information as to the tissue changes in progress; founded on these data directions can be given that often prevent serious illness, and would save from much of the danger incident to sudden injury. The risk of surgical interference would in this way also be much reduced. Many of the explosive accidents that follow, and the alteration of habit implied in the confinement to bed after operations, besides the degree of reaction after shock, would be moderated by attention of this kind; not only the time at which an operation should be performed, but the advisability of submitting to one at all would often be dependent upon the results of such enquiry. Diabetics rarely bear operative proceedings well; when possible some dietary regulation should be carefully observed beforehand. Sometimes it has seemed that carbolic acid given in three to five drop doses, fifteen to twenty minims a day, with chloroform-water for a few days has been of service during the healing of small incisions. It would be of interest to know how far the use of carbolic spray enables diabetic patients to bear the larger surgical operations.

Among the various signs of perverted nutrition glycosuria

has received the fullest share of attention from the frequency with which it is associated with other results of arrested nutritive processes, and because its early recognition would largely prevent a more serious disease. The action of the liver in forming sugar, first shown by Claude Bernard, has been recently confirmed by Professor Seegen, of Vienna; glycœmia is a type of interrupted metabolism; yet in no ailments are medicines supposed to act on the liver less helpful or more injurious. Most illness, and many phases and sensations of illness are called "bilious" by the public; and the public voice is only the echo of past authority. As physiology advances we shall hear no more of diseases caused by "bile." Bile is a continuous product of the liver neither to be increased or disturbed by drugs, not excrementitious, but a necessary element of nutrition. Dr. Murchison, in his last writings, says, "The constant secretion and reabsorption of bile is, in fact, merely part of that osmotic circulation constantly taking place between the fluid contents of the bowel and the blood, the existence of which is too little heeded in our pathological speculations or in therapeutics. The quantity of fluid which is being thus constantly poured out from the gastric and intestinal glands, the liver, pancreas, etc., and then re-absorbed, is enormous: in twenty-four hours it probably far exceeds the whole amount of blood and fluid in the body. The effect of this continued out-pouring is to aid metamorphism; the same substance, more or less changed, seems to be thrown out or re-absorbed, until it is adapted for the repair of tissue or becomes effete. . . . In the course of this osmotic circulation, much of the bile appears to be transformed into products which are eliminated by the lungs and kidneys, while at the same time this circulation assists in the assimilation of nutritive materials derived from the food." Here we see the great nutritive work of the liver; it will form bile and sugar, but not urea and uric acid; the waste is changed into urea elsewhere.

The views held by present students of medicine become in time the basis of popular ideas and phraseology in medical matters. But the phantasmas of science have their attractions, and some shadow of these shadows will be projected into the future: a fanciful pathology seeks for developing germs in every variety of disease, and for the source of gout in the reversion to a prevertebral embryonic liver type. In the passage above quoted we see on the other hand the results of close clinical observation as well as of careful physiological work. Surely there is more to hope in the future from the advance of sober science, than from the transcendental theory of the present or the empiricism of the past.

ON THE TREATMENT OF DIABETES, AND OF SOME CONDITIONS ALLIED WITH GLYCOSURIA.

Treatment.—Whether diabetes be itself a disease, or a disturbance arising in the course of various diseases, whether prominent in acute illness, or one among the obscure symptoms of chronic ailments, and whatever its origin may be, the conditions to be observed in its management are invariably the same: the first essential of successful treatment is a carefully restricted diet.

During the temporary febrile states of those subject to glycosuria, the use of starchy and saccharine foods and diluents, such as arrowroot, corn-flour, cocoa, barley-water, and gruel, is to be avoided; milk is only to be used sparingly, cream is better; glycerine should replace sugar in cookery, and in sweetening tea and coffee. Lemonade is best made with lemon-juice, glycerine, and cold water; in this white of egg may well be diffused. A little gluten rusk may be allowed, with plenty of butter, eggs, and beef-tea. The conscious subject of diabetes mostly adopts this method of nursing the more trifling ailments resulting from cold or fatigue; beef-tea is habitually substituted for gruel; limes and lemons are known as almost the only fruits free from sugar; all kinds of biscuits are known to be wrong; toast is very deceptive. Toasting a slice of bread reduces its bulk, and consequently the proportion of starch is greater in a piece of dry toast than in a piece of quickly made hot toast of the same size; it is least in new and brown bread. A thin slice of bread and butter, or one bit of hot buttered toast is sometimes taken as an indulgence.

Macaroni and vermicelli, unless specially prepared, have to be excluded from all dishes, and all flour or starchy thickenings from soups. Carrot, parsnip, or Jerusalem artichokes are to be rejected, but a mealy potatoe at its best is now and then permissible. These vegetables contain from fifteen to twenty per cent. of starch and sugar, with seventy-five per cent. of water. Turnips contain five or six per cent. of glucose material,

and should be used more sparingly in broths and soups than celery need be. Barley and rice should not be used even in soups, as they contain from near seventy to over eighty per cent. of starch. Pea soup is wrong, as dried peas contain fifty-eight per cent. of starch; this proportion is much less in young green peas, the large proportion of water in fresh and growing plants reduces to a minimum the risk from what may be called the doubtful vegetables. Beetroot and broad beans are inadmissible. Tomatoes and small onions are useful, the large Spanish onion is objectionable; cauliflower, Brussels sprouts, cabbage, sea-kale, boiled celery, vegetable-marrow, French beans, asparagus, and artichoke heads are allowable. The best vegetables are spinach, turnip top, sorrel, lettuce, endive, water-cresses, mustard and cress, cucumbers, and mushrooms. Celery is fairly good; not so rhubarb. If apples could be stewed without sugar, and so of other fruits such as plums, currants, raspberries, and young gooseberries, they would be useful, and perhaps with a little glycerine might be made agreeable. All jams and preserved fruits are bad, so are dried figs, dates, and raisins. Bananas and pineapples are to be avoided; shaddock, oranges, and melons, if eaten without sugar, can be taken sparingly, and even fresh grapes. Peaches and nectarines are the best of all ripe fruits. Strawberries, currants, raspberries, mulberries, and cherries in moderation can be taken. Lemon is the only fruit absolutely without sugar; it is invaluable in every way to the diabetic, with cayenne as a condiment, with glycerine to flavour jellies or cheese-cakes, or with iced and ærated waters for drink. Pickles of all kinds help the appetite, and useful aids are found in anchovy or caviare, truffles, capers, horse-radish, or olives. Oil in any quantity, and with any suitable kind of food, is good. Clear melted-butter must replace many of the white sauces that pass under its name. Oyster-sauce, and oysters unless a very few, should be declined. Crab, lobster, and prawns or shrimps are unobjectionable. Fish of all kinds, turtle, all kinds of fowl and game, and all meats are included in the dietary. Calves head, sweetbreads, tongue, ham, bacon, brawn, Bath chaps, and any meat or fish, salted or dried may be taken. Kidneys are good, but not liver or sausages. Cream can be used in soups and sauces, and is to be largely substituted for milk. Cheese, cream cheese, and Devonshire cream are to be recommended, while butter and eggs in any form and guise are essential. Tea and coffee without sugar, and with more cream than milk, are allowable both morning and evening. With the mid-day meal a little sound bitter beer is often most useful. Alcoholic stimulants would generally afford

grateful help, but no brandy is without liqueur, and no wine can be quite without sugar; claret is best. Hollands, unsweetened gin, and a pure whiskey without sugar, or in small quantity are fit adjuncts to the diabetic dietary.

Many or most of the things here enumerated are given with greater fulness and more system by Dr. Pavy. We both have attended the early demonstrations of Claude Bernard, are followers of Bouchardat, and have the same scientific basis for insisting on the essentials of diet. My object is to emphasize certain details, and to sketch how the ordinary diet of health has to be modified by those who have shown tendency to diabetes.

The changes in diet generally required involve no hardship; not so much as is often put into practice against obesity. To watch the quantity and quality of all one's food, and to weigh the bread taken at meals is equally irksome in both conditions. Very often this care would suffice to stop the first tendency to glycosuria with more time at meals, some quietude afterwards, and avoidance of over-fatigue. Sometimes however it happens that in the first feeling of disturbed health in this direction a mistaken notion of what is light of digestion, or a sense of epigastric weakness, leads to what is considered as the simple diet of bread and milk, or to oatmeal, or rice, and so the initial error of assimilation is aggravated and confirmed. To most active persons it is no hardship to forego gruel and take to soup or eggs. Cold beef and pickles are to be preferred to porridge and toast, and many adults think lobster salad better than light puddings. No one need take pastry; and, at middle life, jams, treacle, and even sugar can be relinquished without much regret. Any modification of the ordinary diet in the direction indicated may be found sufficient to accomplish all that is wished; the stricter rules of the above dietary are seldom required, and then but for a limited time. Only the impulses of panic put all the crude preparations and bare elementary principles that figure in a diet list on trial altogether, and cut off at once every pleasant variety of food. It should be mentioned that almonds and all kinds of nuts can be taken towards the end of a meal. Almond biscuits as well as bits of gluten rusks help, with the olives, towards the appreciation of a glass of claret.

The first and in many cases the only necessary injunction is to give up sugar; none but the very young require it as an article of food; and though to some healthy old people, who have what is called a sweet tooth left, it is not hurtful, yet to others it is a source of acidity when not otherwise specifically injurious. Instead of sugar a teaspoonful of glycerine will sweeten a glass of lemonade or

a cup of coffee. Both tea and coffee are soon relished without sweetening. A tablespoonful of glycerine will be used most days in cooking either with custard or stewed fruit, and in jellies or salads; an ounce of glycerine daily is a safe and convenient limit. Cream must to a great extent be used instead of milk. At breakfast a gluten rusk should be made hot and buttered; a dry rusk will be required with breakfast, luncheon, and dinner or supper, and one is to be heated and smothered in butter at tea-time, or part of one eaten with a little butter and potted meat or anchovy paste. A very thin slice of bread and butter instead can be taken either at breakfast or tea. Bacon, and eggs poached, scrambled, or cooked in any way, should be a standing breakfast dish. To compensate for the diminished allowance of farinaceous food, fat or oil has to supply the hydrocarbonaceous matters needed. Hence boiled ham or fried rolls of bacon are served with chickens or turkey, and oil or butter with fish or other dishes. When this want is considered in the arrangement of the meals bread is not so much missed, and the bit of rusk put in place of the dinner roll satisfies the careless search for crust or crumb that has then become habitual. At the end of dinner any fragments of these rusks placed with biscuits or pulled bread will be relished with the cheese and celery or salad by all people.

Very variable is the power recovered by diabetic patients of assimilating some articles of diet at certain times which at others would surely lead to a marked increase of their infirmity. Some can indulge in forbidden fruits with impunity, or occasionally a doubtful vegetable. Many can take milk fairly well, or need not entirely abstain from it. Sugar must always be excluded from stewed fruits, and from every kind of drink. The balance of assimilation and secretion arrived at after long care in diet has been so disturbed by a single lump of sugar weighing two drachms, taken inadvertently in a cup of tea, as to determine an excretion of six times that weight of glucose in the next twenty-four hours and to make rigorous care for some days needful to overcome the wrong tendency. There are times when all soluble ingesta should be tried for sugar by Fehling's test, and the bread and sauces with iodine. Starch will be found to some extent in all the prepared flours said to be freed from it, either unchanged or partly converted into dextrin. Prepared flours with the starch converted into dextrin are worse than Deville's or Bonthron's, where some of the starch remains. Gluten bread should habitually form part of the dietary; the rusks made by Bonthron are agreeable, either dry, or toasted with butter. Under careless diet a feeling of weakness, loss of flesh, irrita-

bility of manner, or some neuralgic pain, will often indicate an increase of sugar in the urine. This chemical examination confirms, perhaps after it has continued for some time. In such a case a restricted diet has restored, within one week, five pounds of weight to the body, or removed neuralgic pains in two days. A patient, under slightly modified diet, had severe neuralgic pains across both thighs after the fatigue of a journey to London; this ceased shortly after all starch, milk, and sugar had been avoided.

When glycosuria is first detected during an attack of severe illness, it may be difficult to say how far diabetes is an accidental complication or an underlying condition, and impossible to estimate the originating causes at work; hence may arise a caution as to prognosis, but there is no place for hesitation as to treatment. Mostly in grave disease, as of lung or kidney, the diabetic condition has been foreknown, perhaps guarded against by a partial avoidance of starchy and saccharine food; in these cases, restrictions, which had been gradually relaxed as one or another slight departure from a rigid dietary had been found possible, have now to be reinforced. Where this condition had not been suspected, the safety of the patient will depend upon its early recognition and prompt treatment. The good effects of a rigid dietary have to be waited for with more patience in presence of a confirmed diathesis than where glycosuria may be dependent on a less persistent cause; but in either case steady perseverance in the same line of treatment is required, however different may be the primary causes.

Convalescence from certain severe forms of illness is liable, as we have seen, to be interrupted by the occurrence of glycosuria; this, if exceptional after diarrhœa, is less so after cholera; it also follows some febrile attacks. During fever the nitrogenous waste is great, perhaps greater than the excretory means of the body can well deal with, hence amylaceous nourishment is needed; on recovery there should be a craving for meat to restore the previous waste, and it is a mistake to impede its digestion by giving the basins of gruel and rice which hitherto had been taken readily. In some such cases Deville's gluten macaroni, and vermicelli could be added with advantage to soups; in actual glycosuria a strict dietary should not be delayed.

A dietary founded upon the above principles may be made most efficient in combatting the tendency to obesity incident to middle age, when the elimination of waste matters is impeded. Excess of uric acid, and its liability to deposit, is best controlled under a full diet of fresh meat, with a restriction as to bread, pastry, some vegetables, and all sweets. Oxaluria, alternating with excess of uric acid,

may determine concretions that are by all means to be avoided; here caution is required against a lowering plan of treatment, and against the abuse of mineral waters, as well as against the use of sugar and excess of vegetables.

A plan for the strong and active of taking full draughts of hot water an hour before meals, with fresh meat or eggs at each meal, promises well. From half a pint to a pint of water at 120° to 130° Fah. (50° to 55° centigrade) is taken three or four times a day for two or three months, or until the body weight is adequately reduced, the proportion of animal to vegetable food during this time being three to one; this is afterwards kept at two to one; and two of the daily draughts of hot water only, morning and noon, are taken. This plan has the advantage of aiding the removal of waste matters from the body without adding any new element to complicate the delicate chemical processes concerned in nutrition transformations. The high temperature at which the water is taken renders it a gentle gastric stimulant, it has little other efficacy; whether hot water will reach the stomach at any temperature beyond 120° is doubtful; the most inveterate tea drinker pauses at a cup of his, or her, favourite stimulant at the scalding temperature of 140° ; if any be swallowed above 130° it is delayed and loses some heat before it reaches the stomach. But cold water in any quantity would chill and lower the tone of the stomach, less so with a moderate degree of saline impregnation. Some of our thermal waters are available as diluents and deobstruents; others contain lime enough to favour the deposition of oxalates, and it is questionable whether many of the vaunted table-waters are not too hard for habitual beverages. The strongly alkaline waters are much abused at meals and otherwise; they are chiefly resorted to by the public when urinary concretions already exist, and thus the effect of these waters is to exaggerate the ills they are supposed to obviate. Soda repeatedly taken to relieve heartburn leads to crippling deposits in or near the joints, and rigidity of the main arteries. The best drinks, either dietetic or diluent, are the simple aerated waters, such as are made at home in the gazogene, or supplied as "Salutaris;" they mix agreeably with a little lemon juice.

Another combination of ailments, equally common to the spare and the stout, where vertigo, heartburn, flatulence, palpitation, retching, or spasm are symptoms, is found where the urine is free, sometimes very acid, with coarse grains of uric acid separating, sometimes barely acid with phosphates, and often with numerous oxalates in both of those conditions. Here fresh meat is to be preferred to a farinaceous diet, and the tone of the stomach

can be aided by the mineral acids and *nux vomica* with meals; if any alkali is required, half a drachm of bicarbonate of potash in half a tumbler of water taken before a meal is best, or soda can be given with sulphate of soda before breakfast in the effervescing form without fear of these salts acting injuriously; their slightly aperient effect is mostly beneficial.

In confirmed diabetes where diet is strictly attended to, and made the chief part of the treatment, it is well at first to give no medicine at all. Care must be taken that no undigested food or waste matters be too long retained in the stomach and body. Carlsbad and other aperient saline, or mineral waters may be taken before breakfast, but mercurial and strong purgatives are to be avoided. If sugar be always present in any quantity, dietary restrictions as to the amount of azotized food is also required; and with limited food the amount of exertion is to be proportionally reduced, and the waste of the body minimized. The alkalies or alkaline waters are much more rarely useful than is generally supposed; with a largely nitrogenized diet acid urine with more urea results; in these cases an extra cup of tea, or the addition of lemon juice to the ordinary diluent is all that is required. La Bourboule, taken with or after meals, is the only mineral water general useful.

My distrust of the efficacy of alkaline mineral waters in diabetes extends beyond the common salts of soda to any power claimed for salicylate of soda; it may check the formation of lactic, and consequently of butyric, acids in some complications, and it has been used with success in the symmetrical neuralgia of this state; but, without the drug, these neuralgias usually subside after careful dietary. Further, the remedy had no effect on the diabetes itself in several cases under my own observation. In one of these cases the utter uselessness of the Bethesda water was fully demonstrated some years ago; this proof of its inefficiency did not deter my patient from undertaking a journey to America to try its worth at the source, but with no favourable result. The water itself is not much more than a common table-water, a little too hard for ordinary use, but harmless and inert in moderate amount. In large quantities it is injurious, in the same way that a large quantity of any fluid is injurious in diabetes; with the further danger, not imaginary, but confirmed by distressing experience, that misplaced confidence in a futile resort leads to neglect of ordinary precautions, and so to danger and to death.

At the commencement of treatment, ascertain first what degree of improvement takes place from care in diet, then note the further modification that can be brought about by

medicines. Those that act on the contractibility of the blood vessels through the medium of the nervous system are of most service. *Nux vomica* and *ergot*, or *matico*, have been found useful, also iron with strychnine or quinine, and better still with small doses of arsenic; a solution with three or four grains of the former and $\frac{1}{30}$ th of a grain of the latter taken after meals has had a marked effect in aiding the assimilation of a mixed meal, with either bread or potatoes as part of it, and so controlling the production of sugar. Bromide of arsenic solution given in doses of three drops after meals for ten days, has seemed to be instrumental in reducing the quantity of sugar from two to four ounces in the twenty-four hours, after dietary had brought down the amount from sixteen to six ounces a day, in a man under the care of Professor Korányi, of Buda-Pesth. This remedy is rather an uncertain combination of arsenious acid and bromine, moreover its aqueous solution is very unstable, part of the salt being converted into an oxy-bromide of arsenic, and part into arsenious acid, with liberation of hydrobromic acid. In conjunction with bromide of iron some of these obstacles to its more general use have been overcome.

Of the good to be obtained from *codeia*, and from extract of opium, in certain conditions attendant upon diabetes, my experience is amply confirmatory; half a grain of either is given with advantage in a pill, or a solution of *codeia* with dilute hydrochloric acid after meals. But these means are not to be used in the variable glycosuria of stout persons; it is rather when an actual and habitual increase of sugar production, not a mere hindrance to its conversion, is suspected that this hepatic sedative is useful. The improvement in such cases secured by aid of these drugs is not merely temporary, nor is it obtained at the cost of any decline of vital power, rather by a conservation of the nervous energy most readily exhausted in diabetes. Once where complete recovery resulted, after three and a half ounces of sugar were excreted daily, *codeia* in full doses was one of the means employed.

The best results may be expected from treatment as long as all sugar can be, if only for a time, entirely removed. While it persists, the waste products associated with this form of defective nutrition cannot be completely eliminated; they accumulate in the blood and aid the increasing glycosuria in determining those degenerative changes which often affect sight or hearing, and impair both muscular and nervous energy. Even with a temporary disappearance of the sugar the mischief already done may suddenly declare itself, or be irreparable, but generally a considerable steady reduction in its amount is favourable. There are

cases, however, where this cannot be effected; sugar in considerable excess is constantly present in the blood, and not only the excreting organ suffers structurally, but impaired nutrition affects also the nerve centres and the heart. Changes in the myocardium seriously endangering the continuance of the circulation have been demonstrated, and with this the sudden onset and fatal character of what is known as diabetic coma is impending. Acetonæmia is no essential part of this catastrophe. Nor is it dependent upon the formation of oxy-butyric acid, as Stadelmann contends, who, on theoretical grounds, advocates a carbonate of soda treatment; granting in some cases the presence of this acid, yet diabetic coma results from preceding degenerative changes, and is not to be prevented by an alkaline plan of treatment, not even if soda could be given to the extent and in the manner suggested.

Phthisis has happened in young persons as a fatal complication. More often wasting, with extreme thirst and harsh dry skin, occurs without any phthisical signs; here rinsing the mouth with iced water is better than drinking much fluid at a time; or little pieces of ice to suck are grateful; a small dose of pilocarpin may be prescribed with acid for keeping the mouth moist in diabetes; at least it seems well worthy of trial. Moisture is restored to the skin by giving two or three grains of carbolic acid in an ounce of water three or four times a day for short periods; a solution of this strength, sprayed into the mouth and swallowed, relieves dryness of the tongue and throat; this solution of carbolic acid should always be administered during an intercurrent abscess or boil for two days before any incision is practised in diabetic subjects.

Our ability to excite the secreting glands, except by the simplest aperients, is very limited; nor in the treatment of diabetes is this to be regretted, for the kidneys act too much, and there is no marked diminution in the activity of the other secreting organs of the body; the skin may be dry, but perspiration is not uncommon; the peptic glands act freely, for the appetite is large; the liver may be at fault, but is not inactive; lactation is too free in this association; many men diabetic for years are not therefore childless. The activity of the kidneys is directly excited by the presence of sugar; these organs, healthy at first, by degrees suffer from the overwork forced on them.

The two forms of albuminuria met with in diabetes are, perhaps, more readily distinguishable than when complicated in this way. In contracting kidney, associated with gouty glycosuria, the quantity both of albumen and of sugar is small, and the urine is of comparatively low specific gravity; the two conditions have gone on together,

the diabetes being the less prominent, and not the primary one. The other form of albuminuria, with parenchymatous nephritis, appears in the course of typical diabetes; it comes on when the urine has been for some time in large quantity and of high specific gravity, and may co-exist with an excess of urea and of uric acid. The first of these two conditions only is that in which a milk diet is to be recommended, or is even allowable; in the second the use of milk must sometimes be at once prohibited. Grave anxiety, caused by the persistence of both sugar and albumen in the urine after many of the restrictions in diet known to be requisite have been put in force, has been relieved shortly after the use of milk has been entirely stopped, and cream exclusively used as a substitute. As the sugar diminishes the albumen disappears and the quantity of urea increases.

In the course of diabetes sugar may completely disappear from the urine in some unfavourable contingencies. It is commonly absent for considerable periods during favourable convalescence; at these times the diet may be varied to almost any extent, and milk need not be excluded. Such disappearance of the sugar must not be considered as cure of the diabetes; let any shock or fatigue shake the precarious balance of health, and a return to the more strict rules of dietary becomes again necessary. Milk must be again prohibited for a time, because of the large quantity of sugar contained in the whey; very little of this remains in the cream, and least in Devonshire cream; cheese and curd are nearly free from it; butter is entirely unobjectionable. If skim milk is to be recommended in diabetes, why not whey? It is free from curd as well as from cream, while both contain all the sugar of milk. Indeed, it is not surprising that sugar has been recommended in diabetes;—could it be given not only on homœopathic principles, but strictly in homœopathic doses, so that all the sugar injected could be reduced to some minute fraction of a grain a day, improvement would soon be evident.

Curd should be more utilised in the diabetic diet. Cheesecakes made with it vary the fare that so much needs variation. The variety of supply for the more substantial dishes is ample; but for the lighter additions to a meal, that make eating less a duty than a pleasure, there is always room for some new combination. An agreeable cheese-cake, baked in ramakin papers instead of in pastry, can be made, with or without gluten bread and curd, in the following way:—Grate one ounce of bread with the rind of two lemons, and mix with half an ounce of glycerine; with this whisk up the whites of three eggs,

two ounces of cream, and one ounce of fresh butter, melted by heat; add also the juice of the two lemons, and the yolks of the three eggs, well beaten; mix all together, and bake in ramakin cups for about twenty minutes, in a rather quick oven. A little more glycerine, or a little less lemon juice, will modify the flavour and consistence of this confection: it is to be eaten when cold.

The management of diabetes, besides attention to diet, requires moderation in exercise, very complete intervals of repose, plenty of fresh air, and avoidance of any excess in mental or bodily exertion. To control the exacerbations of the disease, absolute rest as well as rigid diet must be enjoined. At these times, for days together, the quantity of sugar excreted exceeds the amount to be derived from the starchy and saccharine food taken; a considerable amount of it must therefore come from amyloid material, and from waste products within the body. The protein compounds may be represented by sugar and ammonia, and their rapid disintegration may give rise to both products; with a less degree of disturbance this change would be less, some of the ammonia would be converted into urea and excreted as such, while less sugar would be formed. Rest and diet without medicine, in the course of diabetes mellitus, has gradually brought about a great diminution in the quantity of urine, a complete absence from it of sugar, with great proportional increase in the urea; and this favourable change has continued for weeks and months with but rare re-appearance of the sugar, though fruit, wine, milk, and ordinary bread, the greatest luxury to a diabetic convalescent, have been allowed.

A return to the use of a mixed diet, or of some proportion of farinaceous food during the cure of diabetes is next in importance to the restricted diet with the variations that render it endurable. It becomes a matter of serious moment to determine at an early period of the treatment what desired articles of food can be assimilated and disposed of without leading to the reappearance of sugar, or to an increase in the amount to which it has been reduced. This can only be done safely by a daily examination of the urine and a careful estimate of the varying degree of glycosuria produced by the variations tried or the quantity of bread allowed; a similar rule is to be observed when extra work is attempted, or some doubtful luxury indulged. The greatest difference is found as to the individual tolerance of matters in most cases obnoxious; one person can take carrots or Irish stew, another almost any kind of fruit. Apart from these idiosyncracies, there is in every case what Bouchardat has called the "personal equation" to

be arrived at, for no two persons require exactly the same directions, and for each one at different times considerable variations become advisable. These must depend upon the results obtained by testing not only as a daily routine but at certain times of the day, and after certain articles of food. A rapid subsidence in the amount of sugar found is always a most favourable indication; in such cases active exercise may at once be resumed and a speedier trial made as to the most suitable variations in diet. When a satisfactory condition is established and ordinary occupations resumed, it may suffice to record once a week the progress made and maintained; with an estimate of the quantity of fluid passed in one day, and the amount of sugar obtained by the cupric test, the following table, with comparative proportions of sugar excreted, is useful for reference:—

Grains to the ounce.	Grains to the litre.	Grammes.	Per centage.
1 equals	35 $\frac{1}{4}$ or	2.3 per litre, or	0.23 per cent.
2 "	70 $\frac{1}{2}$ "	4.5 "	0.45 "
3 "	106 "	7. nearly "	0.7 "
4 "	140 "	9.2 "	0.9 "
5 "	175 "	11.5 "	1.15 "
6 "	211 "	13.7 "	1.37 "
7 "	247 "	16. "	1.6 "
8 "	282 "	18.3 "	1.8 "
9 "	317 "	20.5 "	2.5 "
10 "	352 "	22.8 "	2.28 "
11 "	387 "	25. "	2.5 "
12 "	423 "	27.4 "	2.74 "
13 "	458 "	29.7 "	2.97 "
14 "	492 "	32. "	3.2 "
15 "	530 "	34.5 "	3.45 "
16 "	565 "	36.7 "	3.67 "
17 "	600 "	39. "	3.9 "
18 "	635 "	41.3 "	4.13 "
19 "	670 "	43.6 "	4.36 "
20 "	705 "	45.8 "	4.5 "
21 "	740 "	48. "	4.8 "
22 "	775 "	50. "	5. "
23 "	811 "	52.3 "	5.2 "
24 "	846 "	54.8 "	5.4 "
25 "	881 "	57. "	5.7 "
26 "	916 "	59.3 "	5.9 "
27 "	950 "	61.5 "	6.15 "
28 "	985 "	63.8 "	6.38 "
29 "	1022 "	66.3 "	6.6 "
30 "	1057 "	68.6 "	6.8 "
31 "	1092 "	70.8 "	7.08 "
32 "	1128 "	73. "	7.3 "
33 "	1163 "	75.3 "	7.5 "
34 "	1199 "	77.6 "	7.76 "
35 "	1234 "	80. "	8. "
36 "	1269 "	82.3 "	8.2 "
40 "	1410 "	91.2 "	9.1 "

The relation of diabetes to obesity may be shewn by setting forth, first, the directions formulated by Bouchardat

for the guidance of sufferers from glycosuria ; and, after, some recent rules against obesity.

I.—Bouchardat's general precepts are:—

- (1) Eat moderately and slowly ; all food to be cut small and well masticated.
- (2) Drink as little as possible with meals, and do not take much beef-tea, broth, soups, etc.
- (3) Do not drink much at once ; cold water must only be taken in sips. The mouth can be rinsed with iced water, or kept moist by slowly chewing an olive, or roasted coffee berry.
- (4) Two good meals a day are preferable to three or four.
- (5) Avoid resting up, and especially sleeping after a meal ; rather take a walk on leaving the table.
- (6) Do not go to bed till four hours after dinner, or the last meal.

Exercise, and care as to a healthy state of the skin are also insisted on.

II.—The diet calculated to reduce a tendency to corpulence and also suitable for persons leading a sedentary life may be thus stated :—

- (1) Be regular and punctual at or with your meals ; if appetite is wanting at meal times omit the meal, or take but little.
- (2) Never eat hurriedly, nor when excited or pre-occupied.
- (3) Take articles of food objectionable in glycosuria sparingly, infrequently, or not at all.
- (4) Avoid dishes of unknown composition, or such as are known to be wrong, or to disagree.
- (5) The bread and potatoe allowed must be well masticated and eaten slowly.
- (6) Take two mouthfuls of animal to one of vegetable food at the principal meals. Avoid the skin, and the fibrinous parts of all flesh, fowl, or fish : hence the savoury surface of roast pork, duck, goose, or of fried fish, is to be avoided ; also take but little boiled veal, jelly, calve's head, or mock-turtle soup. In clear soup, shaped pieces of white of egg take the place of Venetian paste ; use no thick soups. Avoid corn-flour, oatmeal, cakes, pastry, treacle, and sugar.
- (7) Never exceed half a pint of any liquid with meals. A little glycerine may be added to tea and coffee, with lemon juice to tea or in water. Weak Liebig's beef-tea, with or without lemon juice, or equal parts of wine and water, can be taken with a meal, or one ounce of brandy, gin, or

whisky, in half a tumbler of water. Avoid champagne, soda water, iced water, bottled beer, ginger or lemonades with meals; also ices and liqueurs either with or after meals. To prevent thirst, drink half-a-pint of plain water an hour before each meal, and at bed-time with a little lemon juice or other addition.

So far, these directions are equally suitable to the more serious as to the slighter disturbances of health. It is, however, a mistake to suppose that stout persons should not take much liquid. The quantity required in health varies with body-weight, season, and amount of exercise; most of it is best taken some time before meals or after exercise. In disturbed health with gastric or renal irritation, neuralgia, some kinds of asthma, or eczema, nearly a pint of quite hot water, taken an hour before breakfast, at noon, and at night, either before supper or an hour before going to sleep, is in my experience remedial. This therapeutic use of hot water advocated by Dr. Germain Sée, has been largely practised and found to be of service without many of the restrictions that have been attached to the original prescription.

No dietary can be safely followed from which fatty matters and farinaceous foods are both excluded. When food is limited in amount it must be highly nitrogenous; the addition of fat, cod liver oil, or butter to such a dietary stays the craving for more at a meal felt by the strong, enables weakly persons to assimilate better the small supply they can take, and lessens the waste of tissue going on in illness. The necessity for extra fluid during any febrile disturbance in the body is well known, and one of the first cares of nursing is to supply this want. Nine-tenths of our food is water, so when meals are reduced in bulk the missing water has to be added as fluid, or in fruit, etc., not as alcoholic stimulant. It is to this last element and not to a meat diet that renal mischief is mostly due.

POSTSCRIPTUM.

After the above was completed, two annual reviews have been published, each with a summary of some late remarks on this subject; they differ so widely upon two points of such importance as to provoke notice. The contraverted points are: First, objections to the use of a meat diet; Second, a return to the discarded "acetone" theory, and reversion to an alkaline and diaphoretic treatment founded upon it. A confused association of glycosuria with gout and rheumatism is at the root of both these errors. As to the first, in *The Medical Annual* published by Kimpton (p. 172), a too facile pen has slipped into writing of "diabetics hurried to their graves by Bright's disease set up by . . . lean meat." Since irritation of the whole urinary tract was called catheter fever, the propriety of attributing well known accidents of a disease to an incident in the treatment has been questioned; and here it cannot be shewn that fresh meat ever sets up kidney mischief; nor indeed, that it favours the increase of uric acid. The gouty who are necessarily restricted in the use of alcohol require a fair amount of animal food. The second point leads to the old error of advocating a markedly alkaline plan of treatment in diabetes on a new theory. When Chevreul, now an active centenarian, first shewed that an alkaline state of the fluids favoured oxidation of the heat-forming elements of food into carbonic acid and water, a theory arose of diabetes resulting from want of alkali in the blood, and consequently carbonate of soda was given in large doses, in some cases to the extent of four or five drachms daily for ten or fifteen days. The results of six cases so treated were published in 1846; in all both the quantity of urine and the percentage of sugar were increased, the latter in some cases to a very great degree. Two of the more advanced cases died, one of pneumonia and one of coma; known accidents of the persistent disease which soda can neither directly produce nor in any wise prevent or avert. The blood is not acid in diabetes, but the urine is; and the new theory would connect this acidity with the acetonaemia of the past. Minskowski finds much of this acidity due to β oxybutyric acid; this splits into aceto-acetic acid and carbonic acid, oxidation of aceto-acetic acid, or of oxyisobutyric acid, will yield acetone. But, acetone only sometimes appears in diabetic urine, and when present in the blood under other conditions, or however administered, has been proved not to produce the symptoms that have been ascribed to it. Yet a writer in Cassell's Year Book of Treatment, (for 1885, page 67), assumes a toxic agent in

diabetic coma, derived from the butyric or formic acid series, which is to be got rid of by alkalis, the vapour bath, and perspiration. In support of this view, a case is mentioned where Hoppe-Seyler found acetone in the urine after poisoning by sulphuric acid; but, as acetonæmia and diabetic coma are not identical but only theoretically and accidentally related to each other, the argument is hardly strong enough to win our assent and still less well-founded for a basis of treatment. One reason why we meet with a recurrence of this treatment is that the rule "for glycosuria give soda" is easier to bear in mind than the chemistry of foods, and the constituents of a large number of suitable varieties; hence a tendency to fall back upon a simple formula even when the theory breaks down on which it is based.

Potash and Lithia water are sometimes prescribed with success when uric acid appears; but it is precisely in these cases that, as Prout long ago pointed out, the prognosis is most favourable. Arthritic symptoms have not unfrequently preceded glycosuria; the same is said on the high authority of Dr. P. W. Latham of transient diabetes as the harbinger of a gouty attack. We may conclude, where the Croonian Lecturer for this year at the Royal College of Physicians begins, by repeating that in these three diseases there are in all changes of the blood, resulting from abnormal metabolism; that these changes differ in each of them; and, that in the pathology of these three disorders there is still much that is obscure and unsettled.

It is to be noted (*vide p. 20*) that after the absorption of sugar the change in the body is from glucose to glycogen by dehydration; a further change in this direction might lead to oxaluria, and be quite distinct from the formation of uric acid.

March 31st, 1886.

ERRATUM—p. 15—for "STOUTER" read "STOUTER."



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